has been merged into *Œnothera*, many species of the latter were examined to see if any such thing occurred in them, but no trace of such growth was detected. This would seem to indicate that if *Godetia* is not entitled to generic rank, it is at least that part of *Œnothera* which looks towards *Epilobium*.

A discrepancy must be noted here, however. In *Epilobium* the hairs of the coma do not begin to form until the ovule has become completely anatropous. But in the *Godetia* observed the incipient coma had all disappeared by the time the ovule had become anatropous, beginning to form before the nucleus is half covered by the coats. These hairs appeared in greatest size and abundance when the axis of the ovule was at right angles to its anatropous position.—J. M. C.

Botany for High Schools and Colleges, by Charles E. Bessey, M. Sc, Ph. D; Henry Holt and & Co., New York, 1880—The question may naturally arise in the minds of many teachers, what need is there of another botany? We have Gray's, Wood's, Youman's, etc, almost every publishing house being represented by a botany; surely it is but publishers' rivalry that is throwing this new book upon the market. Even a casual glance will show, however, that we have here no stereotyped repetition of books that have gone before, but a new departure in American botanical text books. The time has long past when the study of any of our botanical text books will be sufficient to impart even a general knowledge of the science of botany. Once the study of a little morphology, the learning of a few terms in the glossary, and the analysis of a few flowers was thought to be all the profitable study that botany could furnish students. But this state of things has entirely changed and plants are getting to be recognized as living organisms that have life histories, and that have digestion, nutrition, assimilation, circulation, respiration, reproduction and other functions just as remarkably performed as in animals. The question then arises, is it more profitable to study the plant in its life work, or simply to dissect and name its parts and their probable function. It is evident that we can study plant physiology as well as anatomy, and it is this very thing that has been so long neglected in our schools, neglected from lack of suitable text books. Our great botanists have been systematists, as is perfectly natural in a country just developing its flora, hence all botanical work in the schools has followed the same bent. Such work is not to be decried, for it is absolutely necessary and well enough as far as it goes, but it is not all of botany. To our country belong some of the finest works on morphology and classification published and they rank as the very highest authorities, but our physiology remains yet to be written. Prof. Goodale has for several years had such a work in contemplation, but its publication has been delayed, and now Prof. Bessey is the first to occupy this new field.

His book is divided into two parts. Part I is upon the subject of General Anatomy and Physiology. Part II treats of Special Anatomy and Physiology. To give our readers a general idea of

this important and excellent work we give a running summary of its contents. - Part I contains 12 chapters; the subject of Chapter I being Protoplasm; Chapter II treats of the Plant-Cell; Chapter III, Cell Wall; Chapter IV, the Formation of New Cells; Chapter V, the Products of the Cell, such as chlorophyll, starch, aleurone and crystalloids, crystals in cells, cell-sap, oils, resins, etc.; Chapter VI, Tissues, taking up first the various aggregations of cells, then the seven principal tissues, and last the primary meristem; Chapter VII, the Tissue Systems, the sections being the Differentiation of Tissues into Systems, the Epidermal System of Tissues, the Fibro Vascular System of Tissues, the Fundamental System; Chapter VIII, Intercellular Spaces, and Secretion Reservoirs; Chapter IX, the Plant Body, treating of Generalized Forms, Stems, Leaves in General, Arrangement of Leaves, Internal Structure of Leaves, Roots of Plants; Chapter X, the Chemical Constituents of Plants, considering Water in the Plant, Solutions and Plant Food; Chapter XI, the Chemical Processes in the Plant, such as assimilation and metastasis; Chapter XII, the Relations of Plants to External Agents, as temperature, light, gravitation, etc.

Part II begins with chapter XIII upon classification; Chapter XIV considers the Protophyta; Chapter XV, the Zygosporeæ; Chapter XVI, the Oosporeæ; Chapter XVII, the Carposporeæ; Chapter XVIII, Bryophyta; Chapter XIX, the Pteridophyta; Chapter XX, the Phanerogamia; Chapter XXI is devoted to some concluding remarks upon the number of species of plants, the affinities of the groups of plants, and the distribution of plants in time.

Of necessity the work could not be entirely or even mostly original, but rather in Part I a following of that done in the German laboratories and based chiefly upon Sachs' great "Lehrbuch." In Part II the higher plants of course conform to the system of Bentham and Hooker. The classification and treatment of the lower plants seem to be the author's own work and is probably the part of the book that is most original. Part I would at once strike one as a simplified edition of Sachs, for many of his plates are there, and how could it be otherwise, for there are no better. One naturally first turns to those subjects in which he is especially interested and passes his judgment upon a work by what he reads there. Of course this is hardly fair, but it is natural. As the writer has been engaged in investigating the development of the embryo-sac, that subject was naturally looked into first. And, in passing, we must most heartily commend the excellent indexes which make it a pleasure to look up any topic. It seemed to us that Vesque's work in the development of the embryo-sac had been neglected, and the subject was left either in the most uncertain light or with the old idea of the embryo-sac being nothing but an enlarged cell of the nucleus. A careful series of investigations by the writer has confirmed the most important of Vesque's conclusions, and it seems to us that the development of the embryo-sac, with its beautiful division of labor would be interesting to any student. The notion that the embryonal vesicle does not originate in what is to become

the embryo-sac is not spoken of, although repeated observations have proved that there is at first a distinct separation between the sexual cell and the enlarging embryo sac. The "primordial mother-cell of the embryo-sac" can be clearly made out also by any ordinarily careful observer, and then its breaking up into the axial row of four or five cells, the uppermost one of which contains the vesicle and "synergides," the second becomes the embryo sac and the two or three remaining ones subsequently secrete endosperm, can be readily traced. This is mentioned simply because it seems a pity that such an interesting line of investigation was not suggested. There is an abundance of work suggested, however, for the most active class, and we hope that very many classes will undertake it. The author plunges "in medias res," or begins at the beginning, whichever way one looks at it, by introducing as the subject of the very first paragraph, "Protoplasm" This plan he follows throughout, not avoiding the difficult points, but by directly encountering them, before the student knows it he has a clear idea of some very uncertain subjects. With Dr Gray's admirable new text book on Structural Botany and this upon Physiology, the student of botany can get a very excellent knowledge of the science. The arrangement of the book is mostly new and at first glance most excellent, a thing of course to be tested in the class room. As to innovations, the author himself calls attention to two. In Chapter VI he recognizes seven well marked kinds of tissue, viz.: Parenchyma, Collenchyma, Sclerenchyma, Fibrous Tissue, Laticiferous Tissue, Sieve Tissue, and Tracheary Tissue. Of course these include a great many varieties which pass into each other by almost insensible gradations. The other innovation "consists in raising the Protophyta, Zygosporeæ, Oosporeæ, and Carposporeæ to the dignity of Primary Divisions of the vegetable kingdom, co ordinate with the Bryophyta, Pteridophyta and Phanerogamia." The book also contains constant suggestions with regard to laboratory work, such as the best plants from which to get certain tissues, etc., and the best method of treatment. This enables the student to go into the laboratory alone, or rather with the aid of the experience of Prof. Bessey, one of the most successfull of teachers, and perform satisfactorily all the elementary work in the histological structure of plants. We would most cordially commend the work to the use of all professors and students of botany as not only the *best* American book upon the subject, but the *only* one.—J. M. C.

The Valley Naturalist, Vol. II. No. 1—This enterprising journal has again made its appearance and this time it appears that its subscriptlon list makes its success assured. It has now 16 pages and a cover, the subscription price being $1.50. There is surely room for such a publication in the great Mississippi Valley, but a constituency of scientific subscribers and contributors is exceedingly slow to build up. The publisher is Mr. Henry Skaer, N.W. Cor. Third & Pine Sts., St. Louis, Mo.

PACIFIC COAST FLOWERS AND FERNS.—Mr. J. G. Lemmon, of Oakland, Cal., is offering some very fine plants at exceedingly low rates. He is an indefatigable collector, having traveled extensively through the West, and his collections embrace plants from Southeastern Arizona to Washington Territory. He has over 400 of the characteristic plants of Arizona, many of which are entirely new to science. He offers for sale also a collection of 50 species of Pacific Ferns, including many rare and new ones. The following terms place these rare plants within the reach of all who care to have them:

Sets of good specimens of the phænogams will be carefully selected, correctly labeled and forwarded to any address in the United States, free of postage, for $7.50 per 100. Sets of the ferns at $10 per 100. New Ferns at 25 cents each. The sets will be ready for distribution during the Christmas holidays. Applications should be in hand before December.

DECANDOLLE'S PHYTOGRAPHY.—In the American Journal of Science and Arts for August and September, Dr. Gray gives a running account of the contents of DeCandolle's last work, which is so interesting and instructive that we copy a few extracts from it.

Chapter XIII relates to difficulties in phytography which have grown out of various methods or absence of method in the nomenclature of organs, and from the want of consideration of the law of priority in such matters. The result of which in some departments, such as histological morphology, is a state of anarchy not unlike that which prevailed in the names of groups before the days of Tournefort and Linnæus. We may hope that order and lucidity will some day dawn upon this chaos and a common language replace this confusion of tongues. Meanwhile DeCandolle offers certain counsels, the utility of which, he says, is not doubtful nor the application very difficult.

(1) Hold fast to common and universally known names, whether in Latin or in modern languages. *Radix*, *caulis*, *folium*, *flos*, etc., with the vernacular equivalents, are not to give place to new-fangled substitutes. This, he thinks, will rid us of "such useless terms as *caulome*, *phyllome*, etc." Now these terms, along with *trichome*, seem to us legitimate and useful, as succinct expressions of a morphological idea; they are annoying only when pedantically ridden as hobbies over ground on which they are not wanted.

(2) Do not entertain the idea that a change in the mode of considering or defining an organ requires a change of name. Although Linnæus did take the leaf-blade for the leaf, and define it accordingly, that did not much hinder the coming in of a truer view, involving merely a change of the definition. But one may intimate that DeCandolle here comes into conflict with another rule he insists on, namely, that terms should have unmistakably one meaning. When we say—as we ever shall—that leaves are ovate, we speak according to the Linnæan definition; when we say that their insertion is alternate, we use the word in a more comprehensive sense; when we have occasion to declare that cotyledons, bracts, petals, etc., are leaves, we use the word in the most comprehensive sense. All this involves considerable am-

biguity; and the endeavor to keep the new wine in the old bottles causes no little strain. It is borne because it has been applied gradually. If Linnæus had started with, or even reached our ideas, we should happily have had a nomenclature to match. Now we must be content, for descriptive purposes, to employ some words both in a restricted and in a comprehensive sense, and let the context fix the sense, just as it must in ordinary language. Technical precision is only a matter of degree. But it is clear that the excellent rule here laid down need not forbid the introduction of terms to express our conceptions, such as *rhizome*, *caulome*, *trichome*, and the like. Yet these are ill-chosen terms, except the last. In particular, *rhizoma* has long ago been appropriated for something which is not of root nature, but the contrary.

(3) The third counsel is to change the name of an organ, as we do that of a genus or species, only when it is positively contrary to the truth, or when it has been pre-occupied.

(4) Avoid giving special names for rare or ill definable cases of structure. An epithet or short periphrasis is vastly preferable to a new and strange term, which will be seldom used and may be hardly understood. DeCandolle truly remarks that after a great multiplication of terms and distinctions generally comes some good generalization, which does away with a crowd of particular names; that what has happened in carpology is likely to occur for microscopic organs.

(5) Between two or more names choose, not the most agreeable, or even the most significant, but the one best known and most widely recognized

(6) Between names equally known and used adopt the oldest. Which are the older names is not difficult to know in the case of common organs, but is very much so in modern histology.

(7) In this matter of priority or of usage, consider only names taken from (or in conformity with) Latin or Greek. As in systematic botany, scientific and not vulgar names are to be accounted in this regard. Those who like *spaltœffnung* for *stoma* or *stomate* and *scheitel zelle*, must needs follow their own fashion; but the genius of our own and the French language resists their importation, while it adopts or adapts with ease technical terms from classical sources.

(8) Not to admit names contrary to these rules.

Chapter XVI is an interesting and pertinent one, upon the manner in which facts observed under the microscope are described; and on the great saving of space and advantage in clearness which would be gained by the adoption, for all matters perfectly capable of it, of the Linnæan descriptive style, and of Linnæan Latin. Extracts from the German of Schacht, the French of Payer, and the Italian of Gasparrini are given, and by their side a rendering in descriptive Latin; and the words and letters are counted. The German specimen so treated is diminished to considerably less than half the number of words and a little less than half the number of letters. The French simmers down to one-third the number of Latin words and less than half the number of letters; and in the French of descriptive botany to

less than one half. The Italian extract of 51 words and 256 letters is expressed in Latin of Linnæan form by 21 words and 127 letters.

To give the readers of the GAZETTE an illustration of the space saved and the clearness gained by the change to Linnæan Latin we give an extract from Schacht's *Lehrbuch der Anatomie und Physiologie* as quoted and changed by DeCandolle.

TEXT.

"Die Spaltœffnungen (stomata) gehoerem der Epidermis, sie enstehen schon sehr fruh wenn dieselbe noch Epithelial-Beschaffenheit besitzt. Innerhalb einer Zelle der Oberhaut bilden sich namlich durch Theilung zwei neue Zellen, die Membran der Mutterzelle wird darauf resorbirt und die beiden Tochterzellen weichen in der Mitte eine Spalte zwischen sich lassend, aus einander; nach der Turgescenz der Spaltœffnungzellen erscheint nun die Spalte bald enger, bald weiter. Alle Spaltœffnungen der Hohengewaechse bilden sich auf diese Weise, sie bestehen desshalb sæmtlich aus zwei Zellen, den so genannten schliefszellen."

Same Facts in Linnæan Style.

Stomata in epidermis junioris epithelio nascuntur. Intra cellulam unam duæ novæ partitiones apparent, quæ sorores membrana matris soluta fluctuant et fissuram inter se angustam latumve monstrant; quippe vegetabilium superiorum stomata e duabus cellulis germanice *Schliefszellen* (1) vocatis constant.

Style in botanical works is discussed in Chapter XVIII, which all young botanists should study, especially the portion which treats of the admirable style of Linnæus. In speaking of botanical style in the modern languages, the author notices the great advantage which the languages of Latin stock have inherited, and which the English-writing botanists have acquired, of ready and free use of Latin and Latinized technical words by direct transference. Botanical French, English, and Italian, are contrasted with the German in this respect. Noting that the German of conversation inclines to be clear and sententious, while in botanical writings the words lengthen more and more and the sentences become badly involved, our author remarks that recently having read a couple of pages of Vegetable Anatomy, and feeling his brain somewhat fatigued with the frequency of such words as *Sclerenchymfasergruppen*, *Gefassbundentwickelung* and *Entwickelungseigenthumlichkeit*, he asked himself if that was good German style. He then recollected that Gœthe, one of the very greatest of German literary writers, was also a profound naturalist. He opened his *Metamorphose der Pflanzen*, read a page or so, and experienced a relief which he likens to that felt by a sea tossed ocean voyager when the vessel suddenly glides into a quiet harbor.

SYNOPTICAL TABLE FOR THE DETERMINATION OF FIBERS OF VEGETABLE ORIGIN.—The following table is from Vetellart's work "sur les fibres emp oyes dans l'industrie," and may be made considerable use of by botanists in the laboratory. W. H. Seaman, of the Department of Agriculture, in sending an abstract of Vetellart's work to Dr. Gray writes that "Vetellart does not tell much that is new, but has systematized our previous knowledge more than has ever before been done.

The reaction is given with dilute sulphuric acid and iodine; the most highly organized structure giving blue reaction, the less so yellow. Exactly as the more highly organized structures polarize light more strongly, e. g. spiral vessels polarize, parenchyma does not."

Synoptical Table for the Determination of Fibers of Vegetable Origin.

MONOCOTYLEDONS GIVING BLUE REACTION.

Common Name.	Botanical Name.	Where Grown.	Principal Use.	Length of Fiber			Ratio: Diameter to Length.	Diameter of Fiber.		
				Shortest.	Mean.	Longest.		Smallest.	Mean.	Largest.
Spanish grass.	Stipa tenacissima.	Algeria, Spain.	Paper.	5	1.5	3.5	125	.007		.018
Esparto.	Lygeum sparteum.	Spain.	"	1 3	2.5	4.5	160	.012	.015	.020
Pine Apple.		Torrid Zone.	Cordage.	3	5	9	830	.004	.006	.008

MONOCOTYLEDONS GIVING YELLOW REACTION.

New Zealand Flax	Phormium tenax.	New Zealand.	Cordage.	5, 8	9	15, 10	550	.010	.016	.024
Adam's Needle.	Yucca.	Western America.	Paper.	.5	4	6	170	.01	.020	.02
Bowstring Hemp.	Sanseviera Zeylandica.	Torrid Zone.	Cordage.	1 5	3	6	150	.015	.020	.026
Century Plant.	Agave Americana.	Warm Temp Zone.	"	1.5	2.5	4	100	.020	.024	.032
Banana Hemp.	Musa textilis.	Tropics (Philipine).	"	3	6	12	250	.016	.024	.032
Palmetto, etc.	Chamærops humilis.	Warm Temp. Zone.	Paper.							
Date Palm.	Phœnix dactylifera.	" " "		2	3		150	.016	.020	.024
Talipot.	Corypha umbraculifera.	Tropics.		1.5	3	5	120	.016	.024	.028
Palm-oil palm.	Elais Guinensis.	"		1.5	2.5	3.5	230	.010	.011	.013
	Mauritia flexuosa.									
	Raffia tædigera.									
Cocoa.	Cocos nucifera.			.4	.7	1.		.012	.020	.024
Vegetable bristles.	Arenga saccharifera.									

Synoptical Table for the Determination of Fibers of Vegetable Origin.

DICOTYLEDONS GIVING BLUE REACTION.

Common Name.	Botanical Name.	Where Grown.	Principal Use.	Length of Fiber.			Ratio: Diameter to Length.	Diameter of Fiber.		
				Shortest.	Mean.	Longest.		Smallest.	Mean.	Largest.
Flax-Linen.	Linum usitatissimum.	Temperate Zone.	Thread-cloth.	4	25-30	66	1200	.015	022	.037
Hemp.	Cannabis sativa.	" "	Cordage.	5	15-25	55	1000	.016	.022	.050
Hop.	Humulus Lupulus.	" "		4	10	19	620	.012	.016	.018
Nettle.	Urtica sp.	" "		4	27	55	550	.02	.05	.07
China-grass.	Borhmeria nivea.	Warm Temp. zone.	Grass-cloth.	60	120	200	2400	.05	.08	
Paper Mulberry.	Broussonetia papyrifera	" " "	Paper (in Japan).	6	15	25	240, 430	.025	.030	.035
Sunn.	Crotalaria juncea.	(India) Torrid "	Cordage. Sail Cloth.	4	7.8	12	260			
Broom.	Genista scoparia.	Temperate "	Paper.	2	6	9	330			
Spanish Broom.	Spartium junceum.	South " "	Cloth-paper.	5	10	16	500			
White Melilot.	Melilotus alba.	North " "		5	10	18	330			
Cotton.	Gossypium.	South " "	Cloth.	25, 10	25	40, 20				

DICOTYLEDONS GIVING YELLOW REACTION.

Hibiscus.	Hibiscus cannabinus.	Temperate Zone.	Cordage.	2	5	6	240	.014	.021	.033
Linden.	Tilia Europea.	" "	Mats.	1.25	2	5	125	.014	.016	.020
Jute.	Corchorus sp.	(India) Torrid "	Coarse Cloth, Etc.	1.5	2	5	90	.020	.0225	.025
Lace-bark Tree.	Lagetta lintearia.	Brazil Antilles.	Strings.	3	5	6	500	.01		.02
Willow.	Salix alba.	Cold Temp. Zone.	Cords, Cloth.		2	3	90	.017	.022	.030